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⑤④ **Apparatus for producing tubes or rings consisting of pleated flexible tubing.**

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**WO-A-88/03895**  
**DE-C- 3 244 085**  
**FR-A- 2 162 805**  
**FR-A- 2 301 437**

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## Description

This invention relates to apparatus for producing in series layered or pleated tubes or rings each consisting of a comparatively very long length of flexible, non-resilient tubing compacted into a very much shorter tube or ring constituting a unit to be used elsewhere for a particular purpose. Such a purpose may be the dispensing of the tubing in the tube or ring pack for packaging a series of objects respectively in individual packages along a length of the dispensed tubing.

In European patent application No. EP-A-0281355 a device is described for use with a cassette containing a tube or ring pack as aforesaid to be dispensed for the disposal of waste.

Various apparatus' for producing such layered or pleated tubes or rings are disclosed in e.g. WO-A-88/03895, FR-A- 2 301 437, DE-C- 3244 085.

An object of the present invention is to provide an apparatus for the production in series of such layered or pleated tubes or rings at an economically high speed.

According to the present invention, the apparatus for producing in series layered or pleated tubes or rings from a length of flexible, non-resilient tubing comprises a layering tube for controlling the outside diameter of the tubes or rings as they are formed, a central mandrel mounted inside the layering tube for controlling the inside diameter of the tubes or rings as they are formed, means closing the annular passage between the layering tube and central mandrel at one end thereof, means for feeding flexible, non-resilient tubing having a diameter appreciably larger than that of the central mandrel into the other end of the said passage at a rate such that the tubing gathers in the passage, means arranged to reciprocate inside the said passage to compact the tubing into layers or pleats as it gathers towards the closed end of said passage, means for severing a portion of the tubing so compacted from a remaining portion of the tubing, and means enabling a layered or pleated tube or ring when so compacted to be discharged from said passage. Where the tubing is to be packed in a container, such as the aforesaid cassette, an annular container may be mounted at the closed end of the said passage to receive the layered or pleated tube or ring as it is being formed and then to be discharged therewith. The container then has an outer wall contacting the inside surface of the layering tube and a tubular core fitting the central mandrel.

Very advantageously the layering tube and central mandrel may be mounted on a turntable arranged to be indexed round through a series of further stationary positions at which the layered tube or ring can be subjected to further treatment such as the closing of an annular container with a lid to form a cassette as aforesaid and the discharge of the cassette from the

apparatus.

In order that the invention may be clearly understood and readily carried into effect an apparatus for gathering lengths of flexible tubular material into series of layered tubes or rings thereof will now be described, by way of example, with reference to the accompanying drawings, in which:-

Fig. 1 is an elevation, shown partly in section, of mechanism for packing flexible tubular material into individual annular containers;

Figs. 2, 3 and 4 are perspective views showing various details of the mechanism of Fig. 1;

Figs. 5 through 8 are diagrams showing a series of phases on the operation of the mechanism of Figs. 1 through 4;

Figs. 9 through 14 are diagrams showing a series of phases in the operation of mechanisms associated with the mechanism of Figs. 1 through 4; and

Figs. 15 through 17 show details associated with Fig. 11.

The mechanism of Fig. 1 is provided for effecting a basic phase in packing a mass of profusely and tightly layered non-resilient tubing in a container constituting the body 20 of a cassette as particularly described in applicant's co-pending British Patent Application No. 8818365.2. Such cassettes are fed in sequence on a turntable 21 in steps through six stations equidistantly spaced round the axis of the turntable. The mechanism of Fig. 1 may be regarded as located at station I, the body 20 having previously been located at station VI (not shown in drawings) in the position shown on the turntable 21.

The tubing 22, which may be high density polyethylene tubing having a 12 micron wall thickness and 6 inches (15.24 cm) diameter corresponding to the outer diameter of the annular space shown in the body 20. However, it will be appreciated that the invention can be adapted to a wide variety of types of tubing and dimensions. The tubing is derived from a roll 23 thereof resting on rollers 24. Pinch rollers 25 are arranged to withdraw the tubing and thrust it into a reservoir container 26 to provide an amorphous reservoir from which the tubing can be drawn upwards to pass over a roller guide 27 prior to travelling over a floating mandrel 5 and a central mandrel 6 to be layered in a layering tube for packing into the body 20.

Each of the six positions on the turntable is furnished with a layering tube 15 and with a central mandrel 6 which has an appropriately smaller diameter than the tubing 22 and which can slide vertically in the turntable but, for example at station I, is held fixed on the turntable by a split clamp 2 (see also Fig. 4) having pivoted jaws. The floating mandrel 5, however, is unique to station I. As shown in Figs. 1, 5 and 6, the cassette body 20 has a central tubular core 28 that fits on the central mandrel 6. The core 28 is joined to the body 20 by an annular base wall 61. The internal

diameter of the core is 4 inches (10.16 cm) and the diameter of the body is approximately 6 inches (15.24 cm).

At the beginning of a cycle of operations the floating mandrel 5 is in the raised position A shown in Fig. 5, being clamped in that position by pneumatically actuated clamps 29 (Fig. 1) which also clamp the tubing on the mandrel 5. These clamps 29 are mounted on a platform 30 which is then operated to lower the floating mandrel 5 to the position B of Figs 1 and 6. Simultaneously a mounting plate 31 carrying drive rollers 32 (described below) is lowered to carry the rollers 22 to the position of Fig. 6. A tapered lower end 33 of the floating mandrel 5 is consequently located in a tapered recess 34 (Fig. 5) in the central mandrel 6 and an air supply 30 is simultaneously inserted into a recess 35 at the bottom of the central mandrel 6. This member 30, the central mandrel 6, and the floating mandrel 5 are formed with axial passages 36, 37, 38 respectively leading to the top end of a deblocking cone 39 at the top of the floating mandrel to enable a supply of compressed air to form an air bubble in the tubing above the cone to facilitate the passage of the tubing over the cone when being fed towards the body 20.

This feeding forward of the tubing 22 is effected, after the clamps 29 have been withdrawn, by the drive rollers 32 (Fig. 1). There are six of these rubber covered drive rollers mounted on horizontal axes, located at the ends of arms 40 equidistantly distributed round the floating mandrel. Each drive roller 32 is driven by its own individual belt 41 between spools 42, 43 on the drive roller and an associated one of six shafts 44 (Fig. 3) connected together by intervening shafts 44a and universal joints 45 to form a ring carried in bearings 46 on the mounting plate 31. An electric motor 47 drives the shafts 44 about their respective axes. Each drive roller 32 engages a respective one of six pinch rollers 48 mounted in the floating mandrel freely to rotate therein with the tubing material intervening between the engaging drive rollers and the pinch rollers. Thus, the drive rollers in feed the tubing forward to become layered between the central mandrel 6 and the layering tube 15.

As the tubing is being delivered into the layering tube 15 it is cleared away from the drive rollers 32 and compacted by two groups of three compacting shoes 4, 4a (Fig. 2) inter-digitated about the floating mandrel 5. The groups of shoes 4, 4a are carried by stems 49, 49a guided by sleeves 50 and connected to rings 51, 51a respectively connected by connecting rods 52, 52a to crank pins on discs 53, 53a rotated through belts 54, 54a by a power driven shaft 55, the shaft 55 being electrically driven. The crank pins are 180° out of phase so that the groups of shoes 4, 4a compress the pleated tubing alternately.

When the required tubing length has been accommodated the feed rollers 32 are stopped as

also are the discs 53, 53a. The clamps 29 are then caused once more to engage the floating mandrel with the tubing 22 intervening and the platform 30 and mounting plate 31 are raised to return the floating mandrel 5 to the position A (Fig. 7). A hot wire 7 is then carried horizontally through the tubing to sever it between the floating mandrel 5 and central mandrel 6. Reverse rotation is then applied to the feed rollers 36 to withdraw the tubing 22 back to position D (Fig. 8).

The turntable is now indexed to carry the cassette body 20 to station II (Fig. 9). At this station a vertically reciprocable compression ring 56 carried by vertical rods 57 is traversed from position E to position F inside the body 20 to compress the layered tubing inside the body. The ring 56 is then raised again to position E to allow the turntable to be indexed so as to carry the cassette body to station III (Fig. 10).

At station III a compression ring 58 carried by vertical rods 59 is traversed from position E to position G inside the body 20 further to compress the layered tubing inside the body 20.

The cycle times of the movements of the rings 56 and 58 at stations II and III are the same as the cycle time of the operation of the mechanism at station I. This enables the rings comparatively gradually to compress the layered tubing in the body while any air trapped between the tubing layers escapes round the edges of the rings, clearance between the rings and body 20 and core 28 being provided for this.

The turntable is now indexed to carry the body 20 to station IV (Fig. 11) where an annular cap 60 is mounted over the cassette body 20. The cap 60 as well as the body 20 with its core 28 and base wall 61 are moulded from plastics material. The cap 60 is transferred from a stack to a location shown at the top of Fig. 11 between the top of the layering tube 15 and a placing ring 10 carried by vertically reciprocable rods 62 that force the placing ring 10 down between positions L and M to locate the cap 60 over the layered tubing between the body 20 and core 28 (see particularly Fig. 15). The cap 60 has an annular top 63 and a peripheral flange 64 which is a sliding fit inside the layering tube 15 and inside a slightly expanded portion 65 of the body 20 at the top thereof. This avoids any possibility of any tubing being trapped when the cap 60 enters the body 20. The cap presses the pleated part of the tubing slightly further so that, in order to retain the cap 60 in the body 20, three horizontally reciprocable piercing tools 17 equidistantly spaced round the body 20 can be operated simultaneously to force tabs 66 (Fig. 17) out of the body wall to engage a peripheral notch 67 round the periphery of the flange 64. The placing ring 10 retains the cap 60 sufficiently depressed for the tabs 66 to be formed before the placing ring is returned to position L. Clearance is provided between the top 63 of the cap and the cassette core 28 to enable the tubing to be drawn out of the cassette when the cassette is in use.

Alternatively small projections may be formed in the body wall as initially constructed the projections being distributed around the body wall at a uniform height and projecting slightly inwards therefrom. Then the placing ring is used simply to snap the edge of the cap into position beneath the projections.

The turntable 21 is now indexed from station IV to station V (Figs. 12 and 13) where the completed cassette is removed from the apparatus. For this purpose a support 11 is raised from position N to position P to support the central mandrel 6 before it has been released by the clamp 2. The withdrawal of the clamp 2 leaves the way clear for a pushing ring 68 on descending rods 69 to travel from position L to position Q transferring the cassette to a position where it falls away from the pushing ring 68 on to a platform 12. The pushing ring then returns to position L, the clamp 2 clamps the central mandrel 6 again and the support 11 goes back to position N. The way is then clear for the turntable 21 to carry the layering tube 15 and central mandrel 6 to station VI to receive another cassette body 20.

In the movement from station V to station VI the lower end of the central mandrel 6 carries the completed cassette to a position in which it falls from the platform 12 onto a conveyor 70 (Fig. 14).

It will be clear that various methods may be adopted for mounting the next cassette body between the central mandrel 6 and layering tube 15 at station VI (not shown in the drawings). For example the new body 20 can be transferred from a stack thereof to surround a location boss reciprocable towards and away from the bottom of the central mandrel 6. This boss contacts the mandrel while a top support contacts the top of this mandrel so that the mandrel is held against axial movement when the clamp 2 is opened. Thrust rods can then lift the body from the location boss to its location above the clamp 2 which can then be closed to hold the central mandrel again, the clamp being shaped to allow the thrust rods to descend from the turntable.

It has been found that the apparatus described above can pack 100 feet (30.48m) of tubing in a cassette within 15 seconds and three loaded closed cassettes can be produced in one minute. It is thought that with improved driving machinery these speeds can be exceeded. Mechanical, electrical, pneumatic or hydraulic driving means for the step-by-step or reciprocating movements of the parts requiring such movement in timed relationship can readily be designed by those skilled in the art so that such means are not described in this specification.

Various modifications of the mechanisms described above are possible without departing from the scope of the following claims. For example the layered packs of tubing can be formed between the central mandrel 6 and layering tube 15 without any intervening container such as the cassette body 20.

Each pleated pack can then be removed downwards between a pair of reciprocable rings, after the clamp 2 has been opened, the pack being carried to a point where it can be bound, clipped or encased for removal to the point where it is required.

It will be understood that the layering tube need not be a simple imperforate tube but may have apertures therein or it may be constituted by a plurality of parts such as parallel rods arranged to define a tubular envelope surrounding the layered or pleated tubing.

## Claims

1. Apparatus for producing in series layered or pleated tubes or rings from a length of flexible, non-resilient tubing comprising: a layering tube (15) for controlling the outside diameter of the tubes or rings as they are formed, a central mandrel (6) mounted inside the layering tube for controlling the inside diameter of the tubes or rings as they are formed, means (2) closing the annular passage between the layering tube and central mandrel at one end thereof, means (32) for feeding flexible, non-resilient tubing (22) having a diameter appreciably larger than of the central mandrel into the other end of the said passage at a rate such that the tubing gathers in the passage, means (4, 4a) arranged to reciprocate inside the said passage to compact the tubing into layers or pleats as it gathers towards the closed end of said passage, means (7) for severing a portion of the tubing so compacted from a remaining portion of the tubing, said means (2) for closing said annular passage being operable to enable a layered or pleated tube or ring when so compacted to be discharged from said passage.

2. apparatus according to Claim 1, characterised in that it is arranged for an annular container (20) to be mounted in the said passage to receive the layered or pleated tube or ring as it is being formed and then to be discharged therewith, the container having an outer wall contacting the inside surface of the layering tube (15) and a tubular core (28) fitting the central mandrel (6).

3. Apparatus according to Claim 1 or Claim 2, characterised in that a floating mandrel (5) is mounted coaxially with the central mandrel (6) for movement between a first position in which it constitutes a continuation of the central mandrel and a separated position in which it permits the operation of the severing means (7) between the two mandrels, power driven means (47, 41, 44a, 32) being mounted to move with the floating mandrel (5) for feeding the tubing over the floating mandrel and the central mandrel (6) from a source (26) of such tubing.

4. Apparatus according to Claim 3, characterised in that the power driven means comprise drive rollers

(32) distributed round the floating mandrel (5) and engaging pinch rollers (48) mounted to rotate in the mandrel for feeding the tubing along the floating mandrel between the drive rollers and the pinch rollers.

5. Apparatus according to Claim 3 or Claim 4, characterised in that the severing means (7) is a hot wire arranged to travel between the floating mandrel (5) and the central mandrel (6) when separated.

6. Apparatus according to any one of Claims 3 to 5, characterised in that it is arranged for the tubing to be withdrawn from a roll (23) of flattened tubing, the central mandrel (6) and floating mandrel (5) being formed with axial passages (37, 38) for the supply of compressed air therealong when the mandrels are in contact to the end (39) of the floating mandrel where the tubing is received to produce an air bubble in the tubing as it approaches the said end, the latter being shaped to fill the cross-sectional area of the tubing.

7. Apparatus according to any one of the preceding claims, characterised in that it is arranged for the tubing to be supplied from a roll (23) of flattened tubing, power driven rollers (25) being provided for maintaining an amorphous mass of the tubing in a reservoir (26) and the feeding means being arranged to withdraw the tubing from the reservoir.

8. Apparatus according to any one of the preceding claims, characterised in that the means reciprocable inside the layering tube for compacting the tubing into layers or pleats comprises a plurality of shoes (4, 4a) carried at the ends of stems (49, 49a) arranged to be reciprocated longitudinally by means beyond the layering tube.

9. Apparatus according to Claim 8, characterised in that there are two sets of interdigitated stems and shoes, means (53, 53a) mounted on the floating mandrel (5) provided for reciprocating the two sets out of phase with one another.

10. Apparatus according to Claim 9 and any one of Claims 3 to 7, characterised in that the two sets of stems and shoes are carried respectively by two rings (51, 51a) encircling the floating mandrel (5) and arranged to be reciprocated by mechanism (51, 54, 54a, 53, 53a, 52, 52a) mounted to move with the floating mandrel.

11. Apparatus according to Claim 3, characterised in that it includes a first support (31) for the power driven means, a second support (30) for the means arranged to reciprocate for compacting the tubing and clamping means (29) for clamping the tubing to the floating mandrel (5) while securing the floating mandrel to the second support and while the floating mandrel is carried from the separated position to the first position and thereupon releasing the floating mandrel when in the first position.

12. Apparatus according to any one of the preceding claims, characterised in that the layering tube (15) and central mandrel (6) are mounted on a turntable (21) that can be indexed round through a series of

further stationary positions at which each of the layered tubes or rings can be subjected to further treatment.

13. Apparatus according to Claim 12, characterised in that at least one of the further positions is associated with a pressure ring (58, 68) arranged further to compress the tube or ring and then to be withdrawn.

14. Apparatus according to Claim 12 or Claim 13, characterised in that at one of the further positions means (10, 17) are provided for pressing a lid (60) on an open annular container (20) containing the layered or pleated tube or ring and latching the lid to the container.

15. Apparatus according to any one of Claims 12 to 14, characterised in that one of the further positions is associated with means (68) for opening the closing means (2) at the end of the annular passage between the layering tube (15) and central mandrel (6) and for ejecting the layered tube or ring out of the passage.

#### Patentansprüche

1. Vorrichtung zur aufeinanderfolgenden Herstellung von aufgeschichteten oder gefalteten Rohren oder Ringen aus einer Länge eines flexiblen, nicht federnden Schlauches mit einem aufschichtenden Rohr (15) zur Kontrolle des Außendurchmessers der Rohre oder Ringe bei deren Formung, mit einem zentralen Dorn (6), der innerhalb des aufschichtenden Rohres zur Kontrolle des Innendurchmessers der Rohre oder Ringe bei deren Formung angeordnet ist, mit Mitteln (2) zum Schließen der ringförmigen Durchtrittsöffnung zwischen dem aufschichtenden Rohr und dem zentralen Dorn am Ende desselben, mit Mitteln (32) zur Zuführung eines flexiblen, nicht federnden Schlauches (22), der einen deutlich größeren Durchmesser als der zentrale Dorn hat, in das andere Ende der Durchtrittsöffnung in einem Maße, daß der Schlauch sich in der Durchtrittsöffnung sammelt, mit Mitteln (4,4a) zum Hin- und Herbewegen innerhalb der Durchtrittsöffnung zum Verdichten des Schlauches in Schichten oder Falten, wenn dieser sich gegen das geschlossene Ende der Durchtrittsöffnung sammelt, mit Mitteln (7) zum Abtrennen eines so verdichteten Bereiches von dem verbleibenden Bereich des Schlauches, wobei die Mittel (2) zum Schließen der ringförmigen Durchtrittsöffnung derart ausgebildet sind, daß sie ein Entnehmen eines aufgeschichteten oder gefalteten Rohres oder Ringes nach der entsprechenden Verdichtung aus der Durchtrittsöffnung ermöglichen.

2. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß diese für einen ringförmigen Behälter (20) ausgebildet ist, der in der Durchtrittsöffnung angeordnet ist, um das aufgeschichtete oder gefaltete Rohr oder den entsprechenden Ring bei der

Formung zu empfangen und dann mit diesem entnommen zu werden, wobei der Behälter eine äußere Wand, die die Innenfläche des aufschichtenden Rohres (15) berührt, und einen ringförmigen Kern (28) aufweist, welcher an dem zentralen Dorn (6) anliegt.

3. Vorrichtung nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß ein schwebender Dorn (5) koaxial mit dem zentralen Dorn (6) zur Bewegung zwischen einer ersten Position, in welcher er eine Fortsetzung des zentralen Dornes bildet, und einer zweiten Position angeordnet ist, in welcher er die Betätigung der Schneidmittel (7) zwischen den beiden Dornen ermöglicht, wobei kraftangetriebene Mittel (47,41,44a,32) vorgesehen sind zur Bewegung mit dem schwebenden Dorn (5) zur Zuführung des Schlauches über den schwebenden Dorn und den zentralen Dorn (6) von einer Quelle (26) eines solchen Schlauches.

4. Vorrichtung nach Anspruch 3, dadurch gekennzeichnet, daß die kraftangetriebenen Mittel Antriebsrollen (32), die rund um den schwebenden Dorn (5) verteilt sind, und eingreifende Druckrollen (48) aufweisen, die zur Rotation im Dorn zur Zuführung des Schlauches entlang des schwebenden Dornes zwischen den Antriebsrollen und den Druckrollen angeordnet sind.

5. Vorrichtung nach Anspruch 3 oder 4, dadurch gekennzeichnet, daß die Scheidemittel (7) aus einem heißen Draht bestehen, der zur Bewegung zwischen dem schwebenden Dorn (5) und dem zentralen Dorn (6) bei der Trennung angeordnet ist.

6. Vorrichtung nach einem der Ansprüche 3 bis 5, dadurch gekennzeichnet, daß diese für den Schlauch derart ausgebildet ist, daß dieser von einer Rolle (23) eines flachgelegten Schlauches abgezogen wird, wobei der zentrale Dorn (6) und der schwebende Dorn (5) mit axialen Durchtrittsöffnungen (37,38) zur Zuführung von komprimierter Luft durch diese versehen sind, wenn die Dornen in Kontakt mit dem Ende (39) des schwebenden Dornes sind, wo der Schlauch zur Herstellung einer Luftblase im Schlauch aufgenommen wird, wenn er sich diesem Ende nähert, wobei die letzte zum Füllen des Querschnittsbereiches des Schlauches geformt wird.

7. Vorrichtung nach einem der vorangehenden Ansprüche, dadurch gekennzeichnet, daß diese für den Schlauch derart ausgebildet ist, daß dieser von einer Rolle (23) eines flachgelegten Schlauches zugeführt wird, wobei kraftangetriebene Rollen (25) zur Aufrechterhaltung einer amorphen Masse des Schlauches in einem Reservoir (26) vorgesehen sind und wobei die Zuführungsmittel so angeordnet sind, daß diese den Schlauch aus dem Reservoir herausziehen.

8. Vorrichtung nach einem der vorangehenden Ansprüche, dadurch gekennzeichnet, daß die sich innerhalb des aufschichtenden Rohres zum Verdichten des Schlauches in Schichten oder Falten hin und

her bewegendes Mittel eine Mehrzahl von Schuhen (4,4a) aufweisen, die an den Enden von Stangen (49,49a) getragen sind, welche angeordnet sind, um durch Mittel jenseits des aufschichtenden Rohres längs hin und her bewegt zu werden.

9. Vorrichtung nach Anspruch 8, dadurch gekennzeichnet, daß zwei Sätze von zwischenfingerartigen Stangen und Schuhen vorgesehen sind, wobei Mittel (53,53a), die auf dem schwebenden Dorn (5) angeordnet sind, zum Hin- und Herbewegen der beiden Sätze in Gegenphase zueinander vorgesehen sind.

10. Vorrichtung nach Anspruch 9 oder einem der Ansprüche 3 bis 7, dadurch gekennzeichnet, daß die zwei Sätze Stangen und Schuhe jeweils von zwei Ringen (51,51a) getragen sind, die den schwebenden Dorn (5) umgeben und angeordnet sind, um durch einen Mechanismus (51,54,54a,53,53a,52,52a) hin und her bewegt zu werden, der angeordnet ist, um sich mit dem schwebenden Dorn zu bewegen.

11. Vorrichtung nach Anspruch 3, dadurch gekennzeichnet, daß diese eine erste Stütze (31) für die kraftangetriebenen Mittel, eine zweite Stütze (30) für die Mittel zum Hin- und Herbewegen zum Verdichten des Schlauches und Klemmmittel (29) zum Befestigen des Schlauches an dem schwebenden Dorn (5) einschließt, während der schwebende Dorn an der zweiten Stütze gesichert ist und während der schwebende Dorn von der getrennten Position zur ersten Position getragen und daraufhin freigelassen wird, wenn er in der ersten Position ist.

12. Vorrichtung nach einem der vorangehenden Ansprüche, dadurch gekennzeichnet, daß das aufschichtende Rohr (15) und der zentrale Dorn (6) auf einer Drehplatte (21) angeordnet sind, der rund durch eine Reihe von weiteren stationären Positionen geschaltet werden kann, bei welchen jeder der aufgeschichteten Rohre oder Ringe einer weiteren Behandlung unterzogen werden kann.

13. Vorrichtung nach Anspruch 12, dadurch gekennzeichnet, daß genigstens eine der weiteren Positionen mit einem Druckring (58,68) verbunden ist, der zusätzlich vorgesehen ist, um das Rohr oder den Ring zu verdichten und dann abzuziehen.

14. Vorrichtung nach Anspruch 12 oder 13, dadurch gekennzeichnet, daß an einer der nachfolgenden Position Mittel (10,17) zum Pressen eines Deckels (60) auf einen offenen ringförmigen Behälter (20), der das aufgeschichtete oder gefaltete Rohr oder den Ring enthält, und zum Verriegeln des Deckels mit dem Behälter vorgesehen sind.

15. Vorrichtung nach einem der Ansprüche 12 bis 14, dadurch gekennzeichnet, daß eine der weiteren Positionen mit Mitteln (68) zum Öffnen der Schließmittel (2) am Ende der ringförmigen Durchtrittsöffnung zwischen dem aufschichtenden Rohr (15) und dem zentralen Dorn (6) und zum Auswerfen des aufgeschichteten Rohres oder Ringes aus der Durchtritt-

söffnung verbunden sind.

## Revendications

1. Machine pour produire en série des tubes ou anneaux repliés en couches superposées ou plissés à partir d'une longueur de boyau flexible non élastique, comprenant un tube de repliage (15) destiné à déterminer le diamètre extérieur des tubes ou anneaux pendant leur formation, un mandrin central (6) monté à l'intérieur du tube de repliage pour déterminer le diamètre intérieur des tubes ou anneaux pendant leur formation, des moyens (2) qui ferment le passage annulaire entre le tube de repliage et le mandrin central à une de leurs extrémités, des moyens (32) servant à acheminer le boyau flexible, non élastique (22) ayant un diamètre notablement supérieur à celui du mandrin central, dans l'autre extrémité dudit passage, à une vitesse telle que le boyau s'accumule dans le passage, des moyens (4, 4a) agencés pour être mis en mouvement alternatif à l'intérieur dudit passage pour compacter le boyau en couches ou plis au fur et à mesure qu'il s'accumule vers l'extrémité fermée dudit passage, des moyens (7) servant à séparer une partie du boyau ainsi compacté d'une partie restante du tube, lesdits moyens (2) servant à fermer le passage annulaire pouvant être mis en action pour permettre à un tube ou anneau replié en couches ou plissé lorsqu'il est ainsi compacté de s'évacuer dudit passage.

2. Machine selon la revendication 1, caractérisée en ce qu'il est prévu qu'un conteneur annulaire (20) puisse être monté dans ledit passage pour recevoir le tube ou anneau replié ou plissé pendant sa formation, puis être évacué avec ce tube ou anneau, le conteneur ayant une paroi extérieure qui entre en contact avec la surface intérieure du tube de repliage (15) et un noyau tubulaire (28) qui s'ajuste au mandrin central (6).

3. Machine selon la revendication 1 ou 2, caractérisée en ce qu'un mandrin flottant (5) est monté coaxialement au mandrin central (6) pour se déplacer entre une première position, dans laquelle il constitue un prolongement du mandrin central, et une position écartée, dans laquelle il permet aux moyens de coupe (7) d'entrer en action entre les deux mandrins, des moyens (47, 41, 44a, 32) entraînés au moteur étant montés pour se déplacer avec le mandrin flottant (5) pour faire avancer le boyau sur le mandrin flottant et sur le mandrin central (6) en partant d'une source (26) de ce boyau.

4. Machine selon la revendication 3, caractérisée en ce que les moyens entraînés au moteur comprennent des rouleaux d'entraînement (32) répartis sur le tour du mandrin flottant (5) et qui attaquent des rouleaux presseurs (48) montés pour tourner dans le mandrin pour faire avancer le boyau le long du man-

drin flottant entre les rouleaux d'entraînement et les rouleaux presseurs.

5. Machine selon la revendication 3 ou 4, caractérisée en ce que les moyens de coupe (7) sont un fil chaud agencé pour passer entre le mandrin flottant (5) et le mandrin central (6) lorsque ces derniers sont écartés.

6. Machine selon l'une quelconque des revendications 3 à 5, caractérisée en ce qu'il est prévu que le boyau soit tiré d'un rouleau (23) de boyau aplati, le mandrin central (6) et le mandrin flottant (5) étant munis de passages axiaux (37, 38) pour permettre d'envoyer de l'air comprimé, le long de ces passages et lorsque les mandrins sont en contact, à l'extrémité (39) du mandrin flottant, à l'endroit où le boyau est reçu, pour produire une bulle d'air dans le boyau au moment où ce boyau s'approche de ladite extrémité, cette dernière étant conformée pour remplir la section transversale du boyau.

7. Machine selon l'une quelconque des revendications précédentes, caractérisée en ce qu'il est prévu que le boyau est pris sur une bobine (23) de boyau aplati, des rouleaux (25) entraînés au moteur étant prévus pour entretenir la présence d'une masse amorphe de boyau dans un réservoir (26) et les moyens d'avance étant agencés pour extraire le boyau de ce réservoir.

8. Machine selon l'une quelconque des revendications précédentes, caractérisée en ce que les moyens travaillant en mouvement alternatif à l'intérieur du tube de repliage destinés à compacter le boyau en couches ou plis comprennent une pluralité de sabots (4, 4a) montés aux extrémités de tiges (49, 49a) agencées pour être mises en mouvement de translation longitudinale par des moyens situés au-delà du tube de repliage en couches.

9. Machine selon la revendication 8, caractérisée en ce qu'il est prévu deux jeux de tiges et sabots imbriqués, des moyens (53, 53a) montés sur le mandrin flottant (5), qui sont prévus pour entraîner les deux jeux en mouvement alternatif avec déphasage de l'un par rapport à l'autre.

10. Machine selon la revendication 9 et l'une quelconque des revendications 3 à 7, caractérisée en ce que les deux jeux de tiges et sabots sont portés respectivement par deux anneaux (51, 51a) qui encerclent le mandrin flottant (5) et sont agencés pour être mis en mouvement de translation par un mécanisme (51, 54, 54a, 53, 53a, 52, 52a) monté pour se déplacer avec le mandrin flottant.

11. Machine selon la revendication 3, caractérisée en ce qu'elle comprend un premier support (31) pour les moyens entraînés au moteur, un deuxième support (30) pour les moyens agencés pour être mis en translation alternative pour compacter le boyau et des moyens de serrage (29) servant à serrer le boyau sur le mandrin flottant (5) tout en bloquant le mandrin flottant sur le deuxième support, et pendant que le

mandrin flottant est amené de la position écartée à la première position, puis à relâcher ensuite le mandrin flottant lorsqu'il se trouve dans la première position.

12. Machine selon l'une quelconque des revendications précédentes, caractérisée en ce que le tube de repliage en couches superposées (15) et le mandrin central (6) sont montés sur une table tournante (21) qui peut tourner par pas successifs pour se placer sur une série de positions stationnaires suivantes auxquelles chacun des tubes ou anneaux repliés en couches superposées peut être soumis à un nouveau traitement.

13. Machine selon la revendication 12, caractérisée en ce qu'au moins une des positions suivantes est associée à une couronne de pression (58, 68) agencée pour comprimer davantage le tube ou anneau et pour être retirée ensuite.

14. Machine selon la revendication 12 ou 13, caractérisée en ce qu'à une des positions suivantes, il est prévu des moyens (10, 17) servant à appliquer un couvercle (60) sur un conteneur annulaire ouvert (20) qui contient le tube ou anneau replié en couches superposées ou plissées, et pour verrouiller le couvercle sur le conteneur.

15. Machine selon l'une quelconque des revendications 12 à 14, caractérisée en ce qu'une des positions suivantes est associée à des moyens (68) servant à ouvrir les moyens de fermeture (2) situés à l'extrémité du passage annulaire compris entre le tube (15) de repliage et le mandrin central (6) et pour éjecter le tube ou l'anneau replié en couches superposées du passage.

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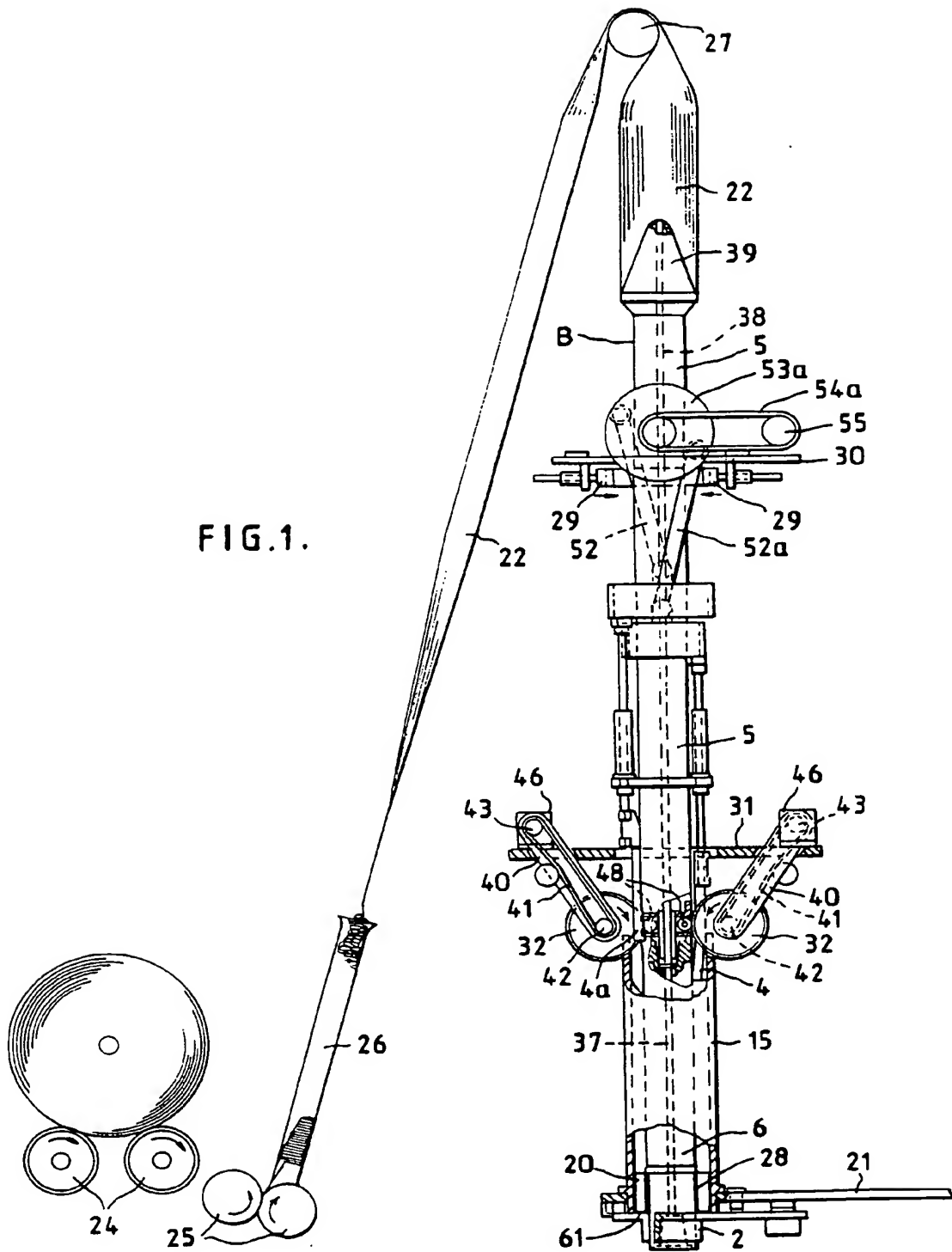
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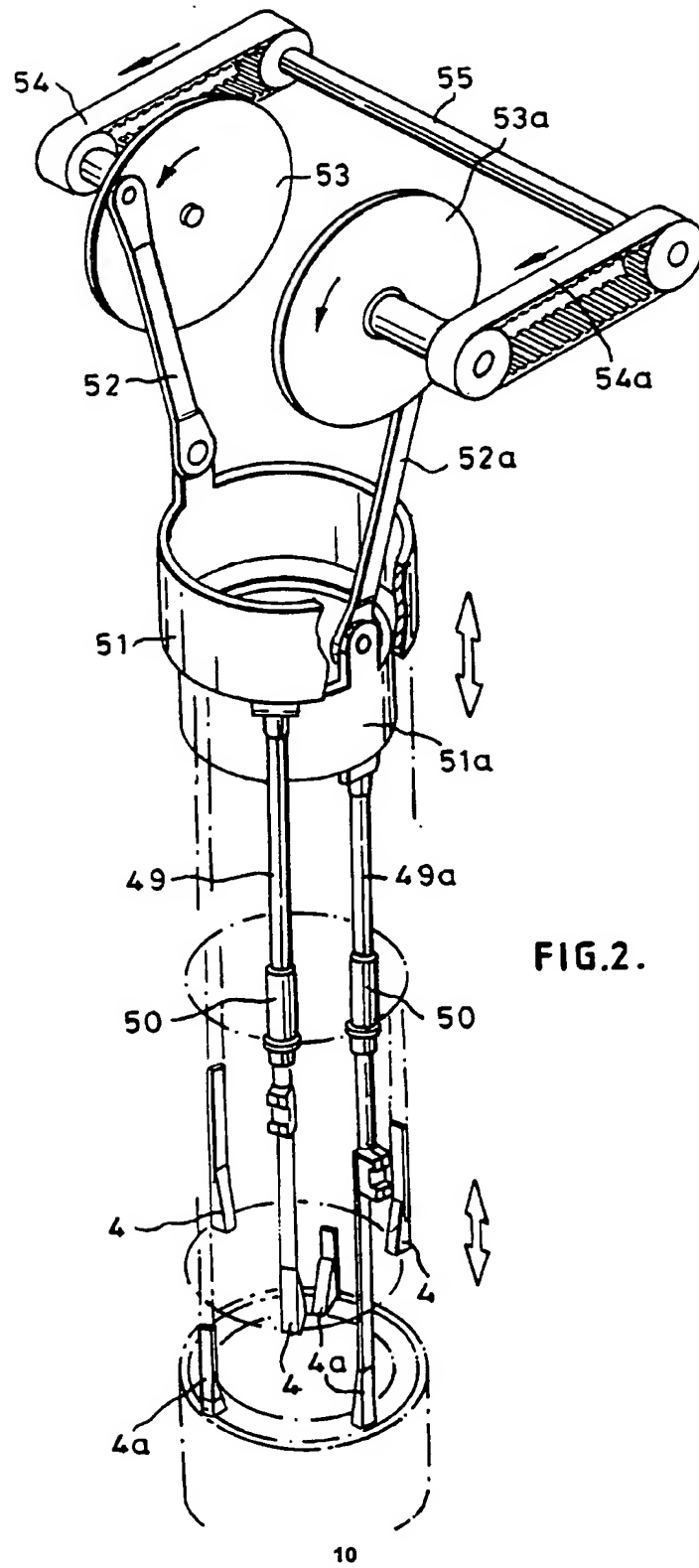
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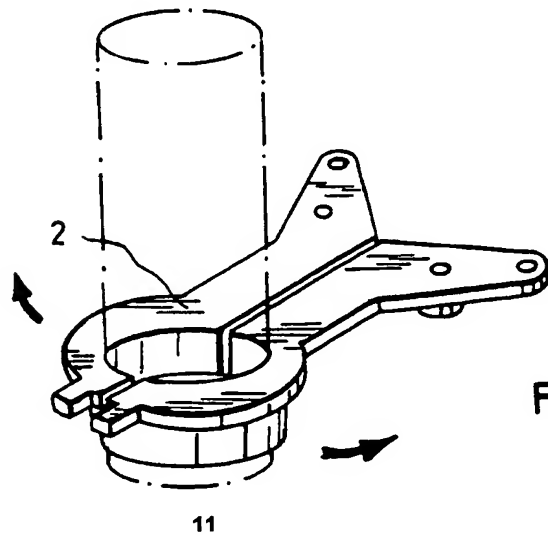
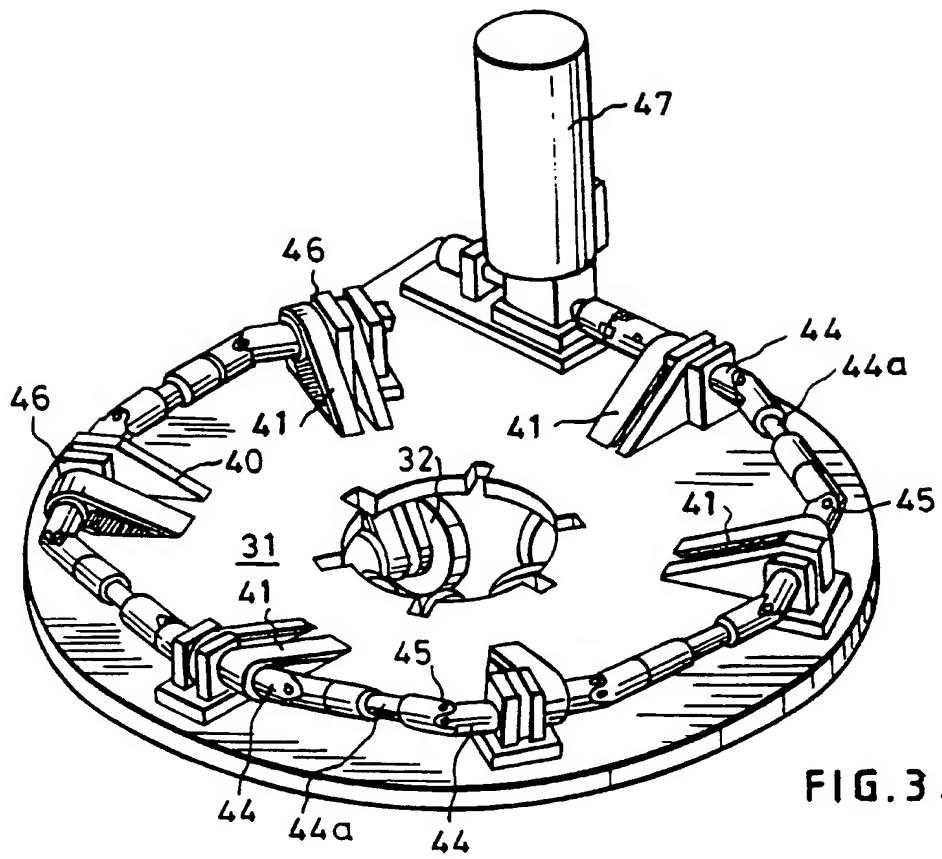
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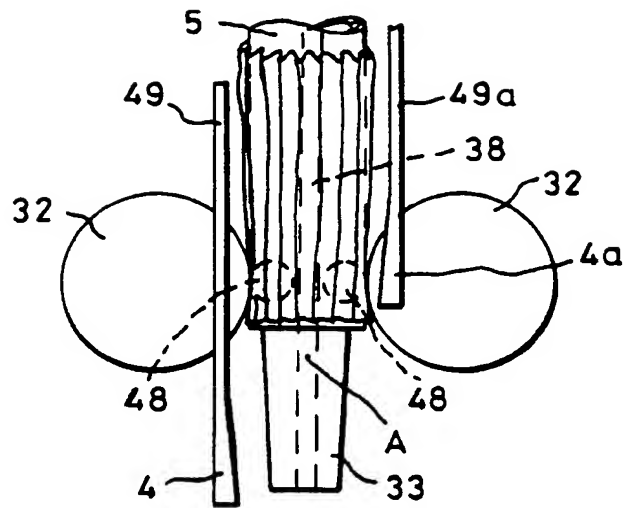
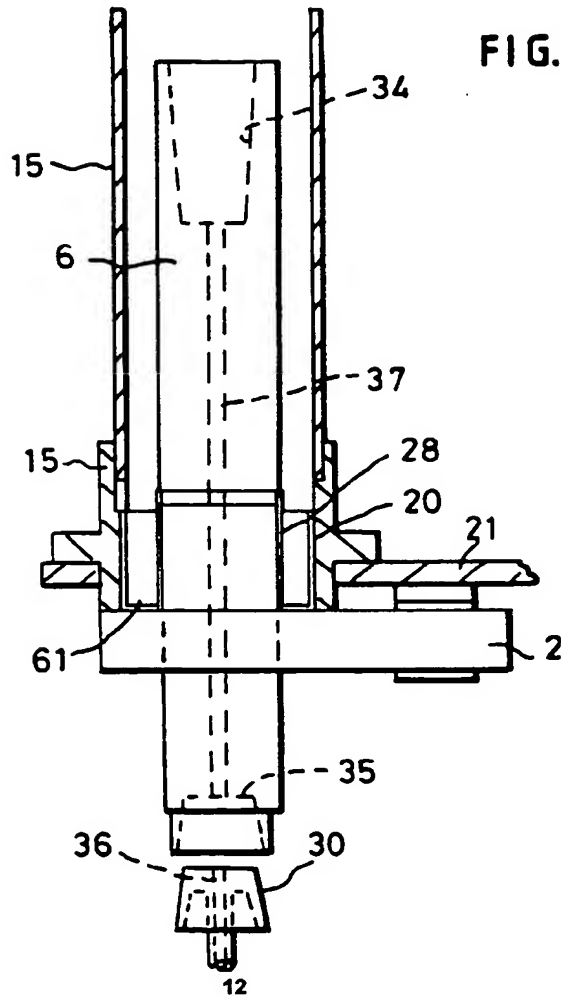


FIG. 5.



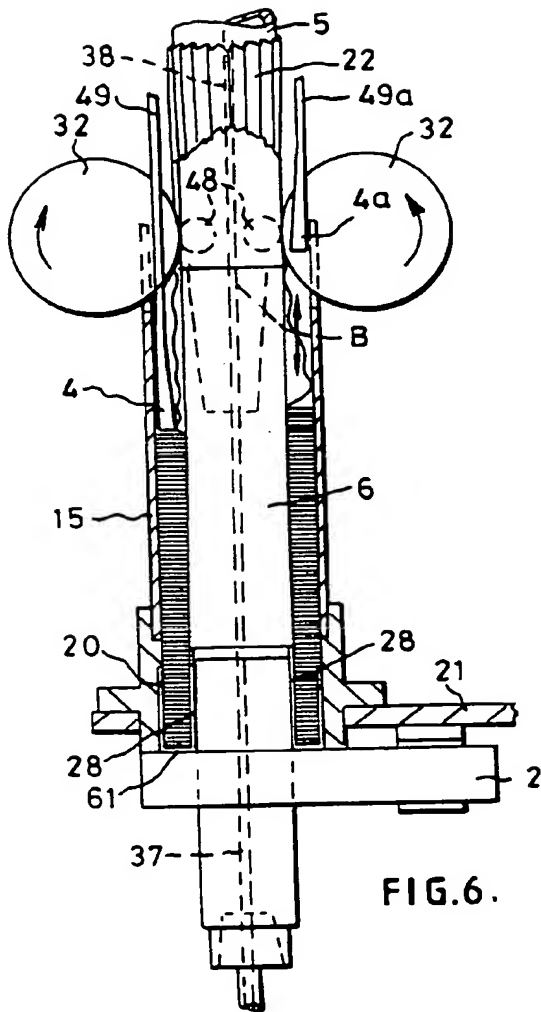


FIG. 6.

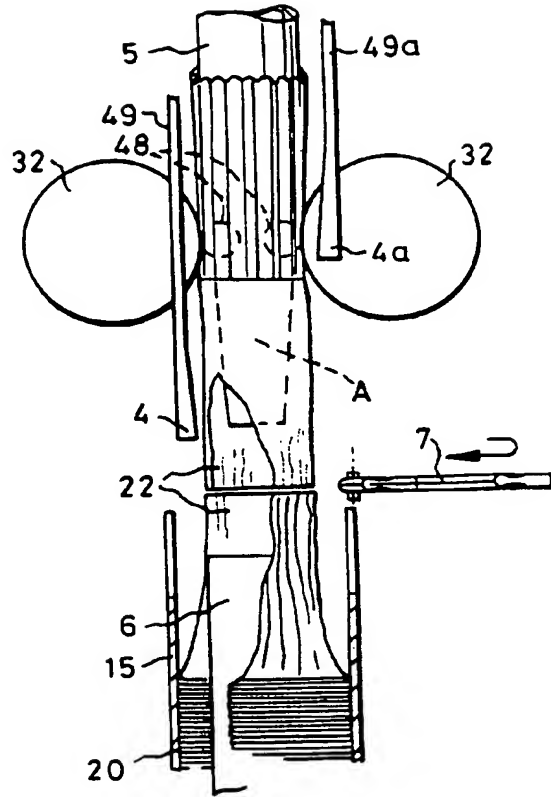


FIG. 7.

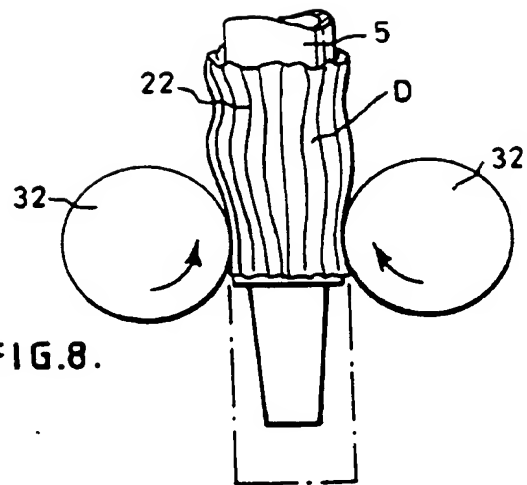


FIG. 8.

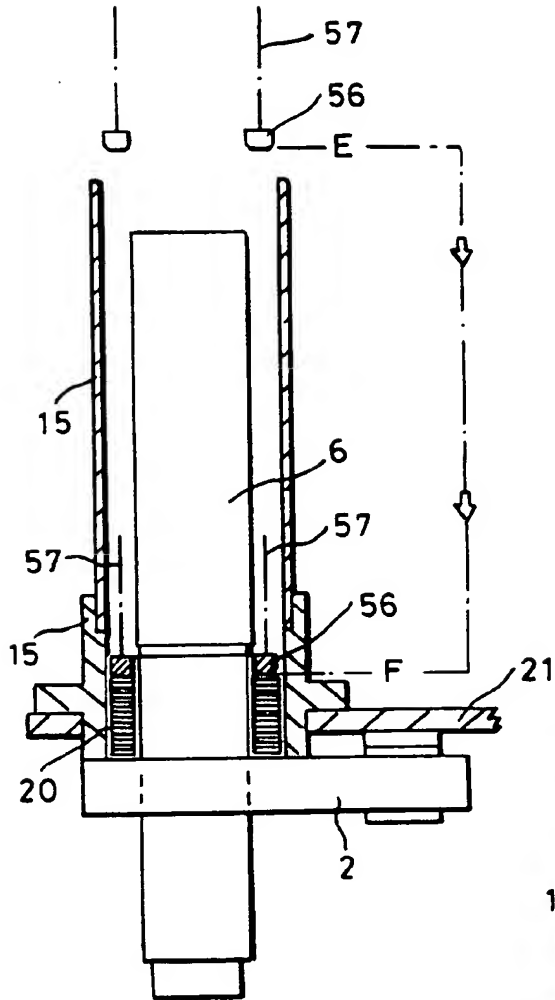


FIG. 9.

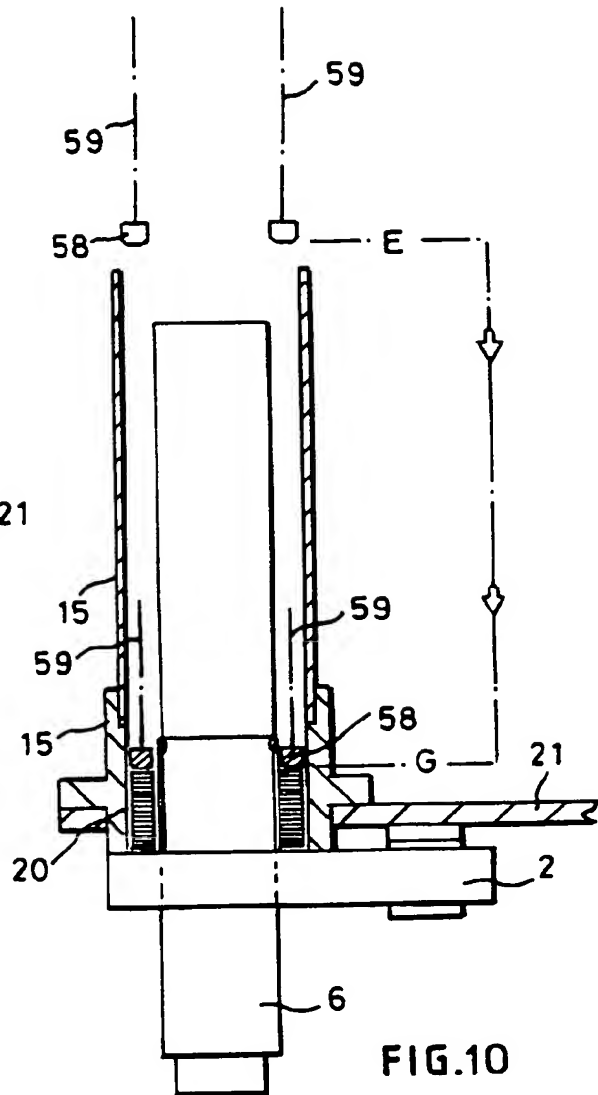


FIG. 10

